EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

PUBLICATION NUMBER : 2002137558
PUBLICATION DATE : 14-05-02

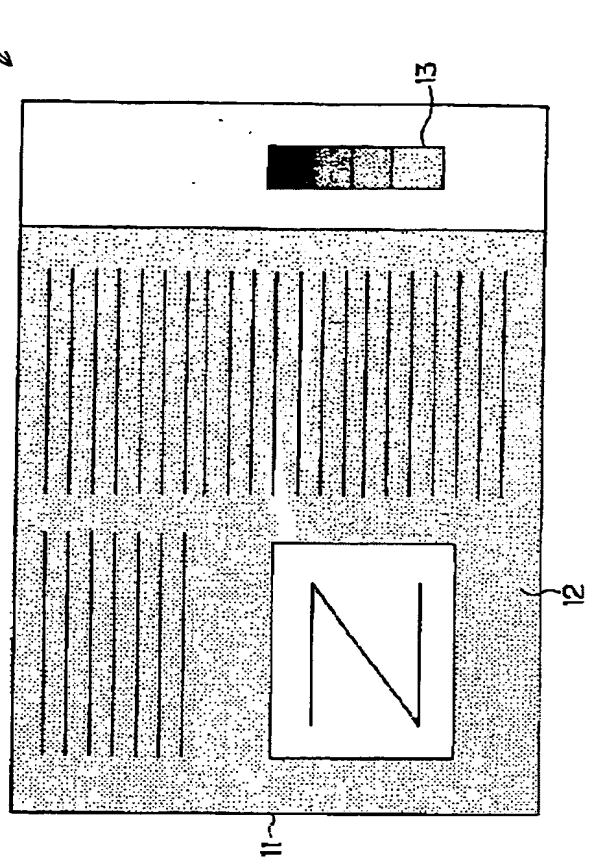
APPLICATION DATE : 06-11-00
APPLICATION NUMBER : 2000337130

APPLICANT : DAINIPPON PRINTING CO LTD;

INVENTOR : HATSUDA TETSUYA;

INT.CL. : B41N 1/12 B41C 1/00 G01N 21/95 G06T 1/00

TITLE : PRINTING PLATE AND ITS USAGE, PRINTING PLATE QUALITY INSPECTION DEVICE AND PRINTING PLATE QUALITY INSPECTION METHOD



ABSTRACT : PROBLEM TO BE SOLVED: To ensure the easy inspection of printing plate quality without lowering productivity and at the same time, the capability of easily seeking printing conditions when these conditions have to be changed.

SOLUTION: The printing plate quality inspection device comprises a printing part 12 with a printing projecting part which prints with an applied ink and a quality verification projecting part which is formed simultaneously with the printing projecting part of the printing part 12 and a quality verification part 13 which verifies the quality of the printing projecting part of the printing part 12 by referring to the quality of the quality verification projecting part.

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－137558
（P2002－137558A）
(43)公開日　平成14年５月14日(2002.5.14)

(51)Int.Cl.⁷	識別記号	ＦＩ		テーマコード（参考）
Ｂ４１Ｎ　1/12		Ｂ４１Ｎ　1/12		２Ｇ０５１
Ｂ４１Ｃ　1/00		Ｂ４１Ｃ　1/00		２Ｈ０８４
Ｇ０１Ｎ　21/95		Ｇ０１Ｎ　21/95	Ｚ	２Ｈ１１４
Ｇ０６Ｔ　1/00	３００	Ｇ０６Ｔ　1/00	３００	５Ｂ０５７

審査請求　未請求　請求項の数８　ＯＬ　（全８頁）

(21)出願番号　特願2000－337130(P2000－337130)

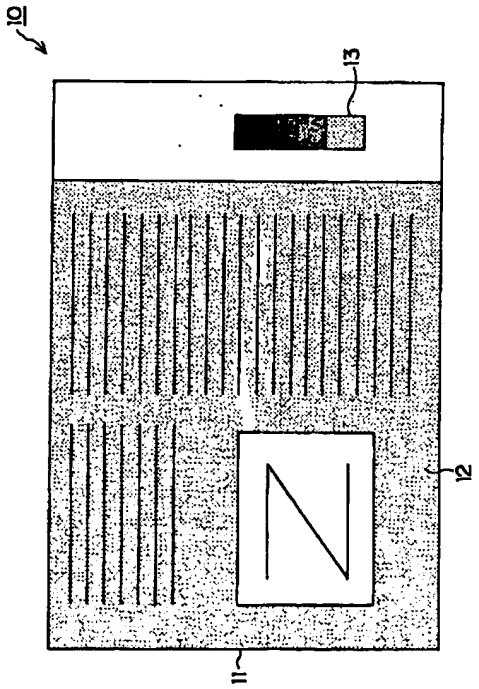
(22)出願日　平成12年11月６日(2000.11.6)

(71)出願人　000002897
大日本印刷株式会社
東京都新宿区市谷加賀町一丁目１番１号
(72)発明者　初田　哲也
東京都新宿区市谷加賀町一丁目１番１号
大日本印刷株式会社内
(74)代理人　100092576
弁理士　鎌田　久男

Ｆターム(参考)　2G051 AA90 AB02 AC15 CA04 CB02
EB01
2H084 AA30 AA40 AE07 BB04 CC01
2H114 AA01 BA01 EA01 EA02 GA01
5B057 AA20 BA02 BA19 DA03 DA20
DC03 DC04

(54)【発明の名称】　刷版とその使用方法、刷版品質検査装置及び刷版品質検査方法

(57)【要約】
【課題】　生産性を低下させることなく、刷版品質を容易に検査することができるとともに、印刷条件を変更しなければならない場合の印刷条件を容易に求めることができる。
【解決手段】　インキを付着して印刷する印刷凸部を有する印刷部１２と、印刷部１２の印刷凸部と同時に形成される品質確認凸部を有し、その品質確認凸部の品質によって印刷部１２の印刷凸部の品質を確認する品質確認部１３とを備える。



【特許請求の範囲】
【請求項１】　インキを付着して印刷する印刷凸部を有する印刷部と、
前記印刷部の印刷凸部と同時に形成される品質確認凸部を有し、その品質確認凸部の品質によって前記印刷部の印刷凸部の品質を確認する品質確認部とを備える刷版。
【請求項２】　請求項１に記載の刷版において、
前記品質確認凸部は、網点パターン状に配置されていることを特徴とする刷版。
【請求項３】　請求項１又は請求項２に記載の刷版において、
前記品質確認凸部は、頭頂部分面積が段階的に変化させられていることを特徴とする刷版。
【請求項４】　請求項１から請求項３までのいずれか１項に記載の刷版を使用する刷版使用方法であって、
前記品質確認部に不透明液体を滴下した後、２枚の光透過性部材で挟んで、その２枚の光透過性部材を所定の間隔に調整し、上方又は下方から光を照射して、その照射光の透過量によって品質確認を行うことを特徴とする刷版使用方法。
【請求項５】　請求項１から請求項３までのいずれか１項に記載の刷版の品質を検査する刷版品質検査装置であって、
光透過性を有し、前記品質確認部に不透明液体が滴下された刷版を挟む２枚の光透過性部材と、
前記光透過性部材を所定の間隔に調整する部材間隔調整手段と、
前記部材間隔調整手段で調整された光透過性部材で挟まれた刷版に対して、上方又は下方から光を照射する光照射手段と、
前記光照射手段で照射された光が前記刷版を透過する透過量によって品質判定する判定手段とを備えることを特徴とする刷版品質検査装置。
【請求項６】　請求項５に記載の刷版品質検査装置において、
前記部材間隔調整手段は、前記判定手段の判定結果が不良の場合に、良好になるまで前記光透過性部材の間隔を変更し、その間隔より印刷補正条件を求めることを特徴とする刷版品質検査装置。
【請求項７】　品質確認部に不透明液体が滴下された刷版を挟む２枚の光透過性部材を所定の間隔に調整する部材間隔調整工程と、
前記部材間隔調整工程で所定の間隔に配置された光透過性部材で挟まれた刷版に対して、上方又は下方から光を照射する光照射工程と、
前記光照射工程で照射された光が前記刷版を透過する透過量によって品質判定する判定工程とを備える刷版品質検査方法。
【請求項８】　請求項７に記載の刷版品質検査方法において、
前記判定工程の判定結果が不良の場合に、良好になるまで前記光透過性部材の間隔を変更し、その間隔より印刷補正条件を求める補正条件出力工程を備えることを特徴とする刷版品質検査方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、印刷、特に、フレキソ印刷に好適に使用可能な刷版とその使用方法、刷版品質検査装置及び刷版品質検査方法に関するものである。
【０００２】
【従来の技術】図７は、フレキソ印刷に使用する凸版の製版方法を示す図である。従来より、フレキソ印刷に使用する凸版１０は、以下のように製版する。ガラス板３１の上に配置した版材１１にマスクフィルム４０を重ね合わせ（マスキング工程＃３０１）、さらに、ガラス板３２を重ねて、ガラス板３１，３２間を真空にして、マスクフィルム４０を密着させ、ＵＶランプ６０で露光し（表露光工程＃３０２）、反転して裏面を露光し（裏露光工程＃３０３）、現像液ｂをかけながら、回転ブラシ７０で未露光部分の樹脂を除去して（現像工程＃３０４）、再度、露光することで（後露光工程＃３０５）、製版している。このようにして製版された凸版１０においては、凸部１１ａの頭頂部形状が、きれいにでていることが、美しく印刷できるか否かのポイントになる（図８（Ａ））。この形状を出すには、版材１１の感度特性、露光条件、現像条件などの製版条件を、すべて適正に管理しなければならず、その管理がうまくいかないと、図８（Ｂ）に示すように、凸部１１ａの頭頂部のエッジがシャープに出なかったり、凸部１１ａの低い不良品が流出するおそれがある。しかし、上記条件は、露光ランプの使用時間、現像液の使用回数等によって変化するため、版材の感度と、露光、現像などの条件が適性であるか否かを検査する必要がある。この検査方法としては、顕微鏡やルーペ、電子顕微鏡等を使用する方法や、着色して目視検査する方法等がある。
【０００３】
【発明が解決しようとする課題】しかし、前述した顕微鏡やルーペ等を使用して凸部１１ａの形状を検査する方法は、版材１１が、透明又は半透明であるので、正確に検査することは、困難である。また、電子顕微鏡で検査する方法は、電子顕微鏡で検査するためのサンプルを切り出し、蒸着等の前処理が必要であるうえ、装置も大がかりである。したがって、製版ラインで、日常的に、電子顕微鏡で検査することは、困難であった。さらに、目視検査するためにＵＶ硬化する部分を着色したのでは、硬化感度の低下を招き、硬化処理に要する時間が増大し、生産性の低下させ、また、より高いＵＶ照射エネルギが必要となる。
【０００４】また、版材の厚みや硬さがロットによって

異なっていると、作製した刷版の品質、すなわち、凸部の頭頂部形状に影響が出てしまう場合がある。このような場合、印刷時に印圧が変化し、転写時のインキ転移率が変化するので、全体の印刷濃度変化を生じる。特に、フレキソなどの凸形状をした版式は、印圧がかけられることにより先端部の凸部がつぶれて、接触面積が大きくなる傾向にあり、これによって、印刷物の色調が大きく変化する。そこで、版材の厚みや硬さがロットによって異なった場合は、印刷条件、刷版条件、現像条件、トーンカーブ等を変更することで、印刷物の色調を一定の品質に保っているが、それらの条件出しが煩雑であった。

【０００５】本発明の課題は、生産性を低下させることなく、刷版品質を容易に検査することができるとともに、印刷条件を変更しなければならない場合の印刷条件を容易に求めることができる刷版とその使用方法、刷版品質検査装置及び刷版品質検査方法を提供することである。

【０００６】

【課題を解決するための手段】本発明は、以下のような解決手段により、前記課題を解決する。なお、理解を容易にするために、本発明の実施形態に対応する符号を付して説明するが、これに限定されるものではない。前記課題を解決するために、請求項１の発明は、インキを付着して印刷する印刷凸部を有する印刷部（１２）と、前記印刷部（１２）の印刷凸部と同時に形成される品質確認凸部を有し、その品質確認凸部の品質によって前記印刷部（１２）の印刷凸部の品質を確認する品質確認部（１３）とを備える刷版である。

【０００７】請求項２の発明は、請求項１に記載の刷版において、前記品質確認凸部は、網点パターン状に配置されていることを特徴とする刷版である。

【０００８】請求項３の発明は、請求項１又は請求項２に記載の刷版において、前記品質確認凸部は、頭頂部分面積が段階的に変化させられていることを特徴とする刷版である。

【０００９】請求項４の発明は、請求項１から請求項３までのいずれか１項に記載の刷版を使用する刷版使用方法であって、前記品質確認部（１３）に不透明液体を滴下した後、２枚の光透過性部材（２１，２２）で挟んで、その２枚の光透過性部材（２１，２２）を所定の間隔に調整し、上方又は下方から光を照射して、その照射光の透過量によって品質確認を行うことを特徴とする刷版使用方法である。

【００１０】請求項５の発明は、請求項１から請求項３までのいずれか１項に記載の刷版の品質を検査する刷版品質検査装置であって、光透過性を有し、前記品質確認部（１３）に不透明液体が滴下された刷版（１０）を挟む２枚の光透過性部材（２１，２２）と、前記光透過性部材（２１，２２）を所定の間隔に調整する部材間隔調整手段（２４）と、前記部材間隔調整手段（２４）で調整された光透過性部材（２１，２２）で挟まれた刷版（１０）に対して、上方又は下方から光を照射する光照射手段（２３）と、前記光照射手段（２３）で照射された光が前記刷版（１０）を透過する透過量によって品質判定する判定手段（２７）とを備えることを特徴とする刷版品質検査装置である。

【００１１】請求項６の発明は、請求項５に記載の刷版品質検査装置において、前記部材間隔調整手段（２４）は、前記判定手段（２７）の判定結果が不良の場合に、良好になるまで前記光透過性部材（２１，２２）の間隔を変更し、その間隔より印刷補正条件を求めることを特徴とする刷版品質検査装置である。

【００１２】請求項７の発明は、品質確認部（１３）に不透明液体が滴下された刷版（１０）を挟む２枚の光透過性部材（２１，２２）を所定の間隔に調整する部材間隔調整工程（Ｓ１０２）と、前記部材間隔調整工程（Ｓ１０２）で所定の間隔に配置された光透過性部材（２１，２２）で挟まれた刷版（１０）に対して、上方又は下方から光を照射する光照射工程（Ｓ１０３）と、前記光照射工程（Ｓ１０３）で照射された光が前記刷版（１０）を透過する透過量によって品質判定する判定工程（Ｓ１０４）とを備える刷版品質検査方法である。

【００１３】請求項８の発明は、請求項７に記載の刷版品質検査方法において、前記判定工程（Ｓ１０４）の判定結果が不良の場合に、良好になるまで前記光透過性部材（２１，２２）の間隔を変更し、その間隔より印刷補正条件を求める補正条件出力工程（Ｓ１１０，Ｓ１１７）を備えることを特徴とする刷版品質検査方法である。

【００１４】

【発明の実施の形態】以下、図面等を参照して、本発明の実施の形態について、さらに詳しく説明する。

（第１実施形態）図１は、本発明による刷版の第１実施形態を示す平面図である。なお、前述した従来技術と同様の機能を果たす部分には、同一の符号を付する。刷版１０は、版材１１に、印刷部１２及び品質確認部１３を形成する。なお、この刷版１０は、フレキソ印刷等に使用される凸版である。

【００１５】版材１１は、感光性樹脂による版材である。感光性樹脂は、光、特に波長３５０～４００ｎｍ程度の紫外線で露光すると硬化又は不溶化する。一方、未露光部分は、変化せず、水、アルカリ水溶液又はアルコールなどの有機溶剤に対して可溶である。

【００１６】印刷部１２は、版材１１のうち、インキを付着して印刷を行う部分である。印刷部１２には、印刷凸部が形成されており、その印刷凸部の頭頂部分にインキを付着して印刷を行う。

【００１７】品質確認部１３は、版材１１のうち、刷版１０の品質確認を行う部分である。品質確認部１３には、網点パターン状の品質確認凸部が形成されており、

その網点面積率は、段階的に変化している。なお、この品質確認凸部は、印刷部１２の印刷凸部と同時に形成される。このため、品質確認凸部の品質は、印刷部１２の印刷凸部の品質と同等であり、品質確認凸部の品質によって、印刷部１２の印刷凸部の品質を確認することができる。品質確認部１３には、後述のように、不透明液体（例えば、染料溶液、墨汁など）が滴下されて、透明板２１，２２で挟み込まれた場合の光透過性が確認されることで、品質確認凸部の品質が確認される。この品質により、上述の通り、印刷部１２の印刷凸部の品質が確認される。

【００１８】図２は、本発明による刷版品質検査装置の第１実施形態を示す図である。刷版品質検査装置２０は、透明板２１，２２と、光源２３と、加圧機構２４と、加圧機構制御部２５と、カメラ２６と、判定処理部２７とを備える。

【００１９】透明板２１は、前工程で製造された刷版１０を載置する板状体である。透明板２１は、光透過性を有することが必要であり、例えば、無色透明のガラス板等が好適に用いられる。透明板２２は、刷版１０の上に配置され、透明板２１とともに、刷版１０を挟む板状体である。透明板２２も、透明板２１と同様に光透過性を有することが必要であり、透明板２１と同様のものが好適に使用される。

【００２０】光源２３は、刷版１０を照らす光源である。本実施形態では、光源２３は、透明板２１の下から刷版１０を照らしている。加圧機構２４は、透明板２２を加圧して上下移動させる機構である。加圧機構制御部２５は、判定処理部２７より加圧指令信号を受けて、加圧機構２４を制御する。カメラ２６は、透明板２１，２２で挟まれた刷版１０を透過した光の状態を撮像する。また、カメラ２６は、矢印に示すように、前後左右に移動自在となっている。本実施形態では、カメラ２６は、透明板２２の上から刷版１０の透過光の状態を撮像する。カメラ２６は、刷版１０の透過光の状態を撮像すると、その画像信号を判定処理部２７に送信する。

【００２１】判定処理部２７は、カメラ２６の画像信号を受信して、透過光による網点パターンの大きさが規定寸法であるか否か判定する。網点パターンの大きさが規定寸法であるということは、刷版１０の現像状態が良好であるということである。判定処理部２７は、網点パターンの大きさが規定寸法に収まっていないと判定したときは、刷版１０の現像状態が良好でないということなので、その対策のために、引き続いて、印刷条件を変更するための条件出しを行う。すなわち、判定処理部２７は、加圧機構制御部２５に加圧指令信号を送り、加圧機構２４の透明板２２に対する加圧値を変更させて、網点パターンの大きさが規定寸法内に収まる条件を検討する。

【００２２】図３は、刷版品質検査装置の動作を説明するフローチャート、図４は、刷版品質検査装置の検査方法を示す図、図５は、刷版品質検査装置の印圧補正値の出力方法を示す図、図６は、刷版品質検査装置の押し込み量ー印圧相関線図である。刷版１０に、不透明液体を滴下して充填してから（ステップ（以下「Ｓ」という。）１０１；図４（Ａ））、透明板２２をセットして、加圧機構２４で加圧し（Ｓ１０２；図４（Ｂ））、刷版１０との距離が規定寸法に達したら光源２３で照射して透過光による網点パターンをカメラ２５で撮像する（Ｓ１０３）。そして、判定処理部２７で、全部の網点パターンを確認できるか否かを判定する（Ｓ１０４；図４（Ｃ）～（Ｅ））。

【００２３】全網点パターンを確認することはできないとき、すなわち、一部の網点パターンしか確認することができない場合や（図４（Ｄ））、全網点パターンを確認することができない場合は（図４（Ｅ））、刷版１０の頭頂部が規定寸法よりも低く、透明板２２との間に不透明の液体が入り込んでいるものと判定できる。なお、このようになる原因としては、刷版の材料である版材の露光感度が低下や現像処理の不適切により、現像不良を生じた場合や、版の厚さが薄い場合など、刷版品質に問題があって、凸部の高さが低くなったということが考えられる。

【００２４】そこで、全網点パターンは確認できない場合に（図５（Ａ））、加圧機構２４で、透明板２２の加圧圧力を増圧させて、透明板２２を押し込み（Ｓ１０５）、透明板２２の透過光の網点パターンをカメラ２５で撮像し（Ｓ１０６）、全網点パターンが規定寸法内に収まるようになるまで（Ｓ１０７）、押し込み上限量を超えない範囲で加圧し続ける（Ｓ１０８）。

【００２５】そして、全網点パターンが規定寸法内に収まるようになった場合は（Ｓ１０７；図５（Ｂ））、押し込み量ー印圧相関線図（図６）より、基準印圧に対する印圧変更量を求めて、印圧補正値として出力する（Ｓ１１０）。さらに、刷版、圧胴間のギャップや版材に使用するクッションテープの変更など、より具体的な印刷条件の変更内容を出力してもよい。一方、押し込み上限量まで押し込んでも（Ｓ１０８）、確認できない網点パターンがある場合や（図５（Ｃ））、凸部先端がつぶれて接触面積が大きくなり規定寸法を超えてしまう網点パターンが出現する場合は（図５（Ｄ））、印刷時の加圧条件変更では対応することができないので、ＮＧ信号を出力して（Ｓ１０９）、処理を終了する（Ｓ１１９）。なお、この場合は、刷版、現像条件の見直し、版材の変更などの対策を別途検討することとなる。

【００２６】一方、全網点パターンを確認できるときは（Ｓ１０４；図４（Ｃ））、その網点パターンが規定寸法内に収まるか否か判断する（Ｓ１１１）。規定寸法に収まっていない場合は（図５（Ｄ））、凸部先端がつぶれて接触面積が大きくなり規定寸法を超えていると考え

られるので、加圧機構２４の透明板２２への加圧圧力を減圧させて（Ｓ１１２）、透明板２２の透過光の網点パターンをカメラ２５で撮像し（Ｓ１１３）、全網点パターンが規定寸法内に収まるようになるまで（Ｓ１１４）、押し込み下限量を超えない範囲で減圧し続ける（Ｓ１１５）。

【００２７】そして、全網点パターンが規定寸法内に収まるようになった場合は（Ｓ１１４）、押し込み量ー印圧相関線図（図６）より、基準印圧に対する印圧変更量を求めて、印圧補正値として出力する（Ｓ１１７）。さらに、刷版、圧胴間のギャップや版材に使用するクッションテープの変更など、より具体的な印刷条件の変更内容を出力してもよい。一方、押し込み下限に達しても（Ｓ１１５）、規定寸法を超える網点パターンがあるときは、印刷時の加圧条件変更では対応することができないので、ＮＧ信号を出力して（Ｓ１１６）、処理を終了する（Ｓ１１９）。

【００２８】全網点パターンを確認でき（Ｓ１０４）、その網点パターンが、規定寸法内に収まるときは（Ｓ１１１；図４（Ｃ））、刷版１０の品質が良好であり、透明板２２との間に不透明の液体が入り込む余地がないと判定できるため、ＯＫ信号を出力して（Ｓ１１８）、処理を終了する（Ｓ１１９）。

【００２９】本実施形態によれば、刷版の品質確認部１３に不透明液を充填して透明板２１，２２で挟んだ状態で光の透過度を確認するだけで、容易に、刷版の品質を確認することができる。また、品質がよくない場合には、印刷補正条件を迅速に提示可能である。このため、版材の感度特性や現像液の特性変化に起因する刷版品質の劣化をいち早く捉えることができ、安定した刷版品質を得ることが可能となる。また、版材のロットの違いにより印刷物の色調が変化し、印刷現場において条件の見直しを行っていた場合においても、事前に印刷条件の補正量を得ておくことで条件出しの効率化を図ることができ、生産効率の向上を図ることができる。

【００３０】（変形形態）以上説明した実施形態に限定されることなく、種々の変形や変更が可能であって、それらも本発明の均等の範囲内である。例えば、透明板は、ガラス板に限らず、高い光透過性を有するものであれば、例えば、透明樹脂板等であってもよい。また、本実施形態では、品質確認部は、網点パターンで形成したが、例えば、市松模様状のものであっても同様の効果が得られる。

【００３１】

【発明の効果】以上詳しく説明したように、請求項１の発明によれば、インキを付着して印刷する印刷凸部を有する印刷部と、その印刷部の印刷凸部と同時に形成される品質確認凸部を有する品質確認部とを備えるので、品質確認凸部の品質を確認することで、容易に印刷凸部の品質を確認することができる。

【００３２】請求項２の発明によれば、品質確認凸部は、網点パターン状に配置されているので、品質確認しやすい。

【００３３】請求項３の発明によれば、品質確認凸部は、頭頂部分面積が段階的に変化させられているので、より正確に品質確認することができる。

【００３４】請求項４の発明によれば、品質確認部に不透明液体を滴下した後、２枚の光透過性部材で挟んで、その２枚の光透過性部材を所定の間隔に調整し、上方又は下方から光を照射して、その照射光の透過量によって品質確認を行うので、簡易に品質確認することができる。

【００３５】請求項５の発明によれば、光透過性を有し、品質確認部に不透明液体が滴下された刷版を挟む２枚の光透過性部材と、前記光透過性部材を所定の間隔に調整する部材間隔調整手段と、前記部材間隔調整手段で調整された光透過性部材で挟まれた刷版に対して、上方又は下方から光を照射する光照射手段と、前記光照射手段で照射された光が前記刷版を透過する透過量によって品質判定する判定手段とを備えるので、容易に品質確認することができる。

【００３６】請求項６の発明によれば、判定手段の判定結果が不良の場合に、良好になるまで光透過性部材の間隔を変更し、その間隔より印刷補正条件を求めるので、印刷補正条件を簡単に求めることができる。

【００３７】請求項７の発明によれば、品質確認部に不透明液体が滴下された刷版を挟む２枚の光透過性部材を所定の間隔に調整し、その刷版に対して、上方又は下方から光を照射し、照射光が前記刷版を透過する透過量によって品質判定するので、簡易に品質判定可能である。

【００３８】請求項８の発明によれば、判定工程の判定結果が不良の場合に、良好になるまで光透過性部材の間隔を変更し、その間隔より印刷補正条件を求めるので、印刷補正条件を容易に求めることができる。

【図面の簡単な説明】

【図１】本発明による刷版の第１実施形態を示す平面図である。

【図２】本発明による刷版品質検査装置の第１実施形態を示す図である。

【図３】刷版品質検査装置の動作を説明するフローチャートである。

【図４】刷版品質検査装置の検査方法を示す図である。

【図５】刷版品質検査装置の印圧補正値の出力方法を示す図である。

【図６】刷版品質検査装置の押し込み量ー印圧相関線図である。

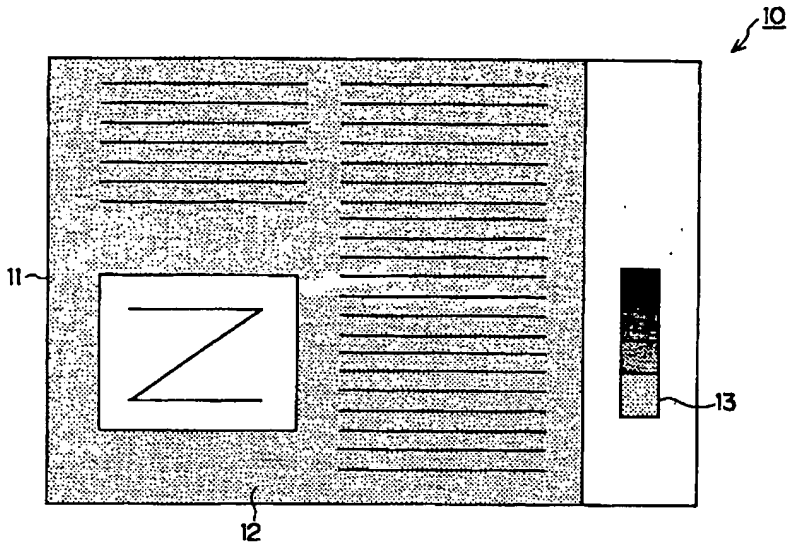
【図７】フレキソ印刷に使用する凸版の製版方法を示す図である。

【図８】製版された凸版の正常、不良の状態を示す図である。

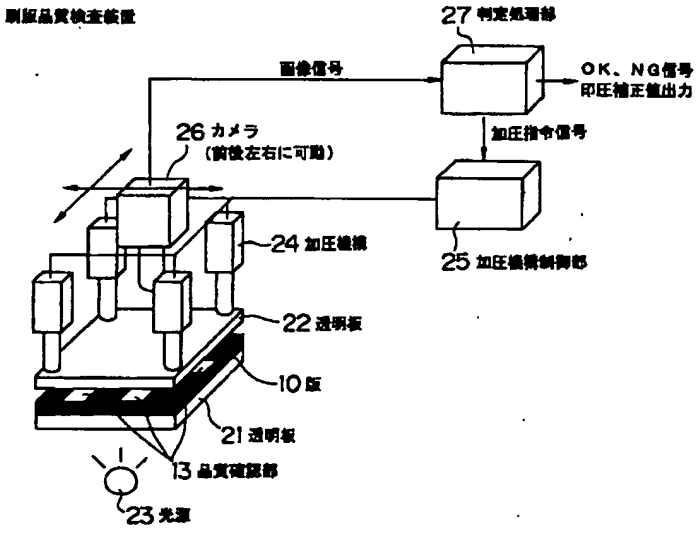
【符号の説明】

１０　刷版
１１　版材
１２　印刷部
１３　品質確認部
２０　刷版品質検査装置
２１，２２　透明板
２３　光源
２４　加圧機構
２５　加圧機構制御部
２６　カメラ
２７　判定処理部

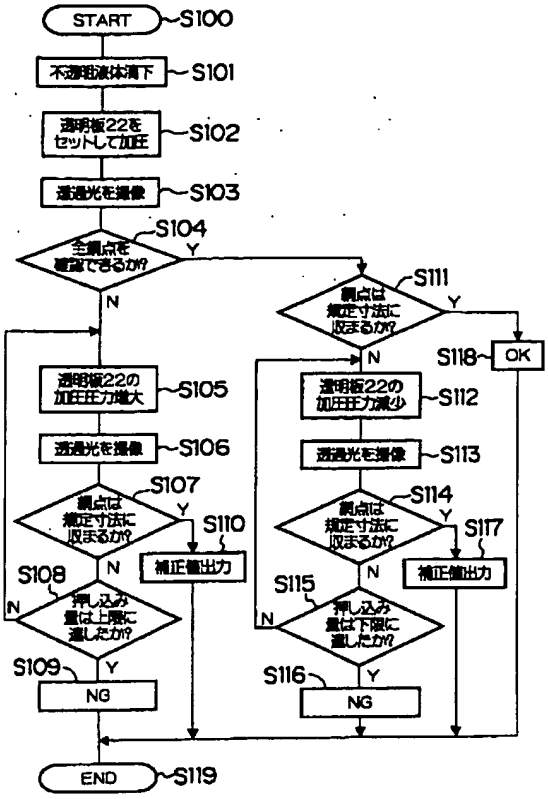
【図１】



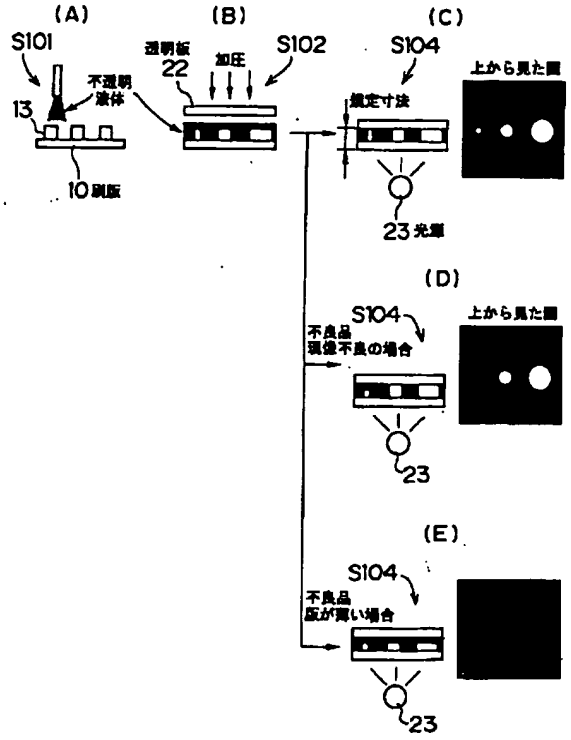
【図２】



【図３】

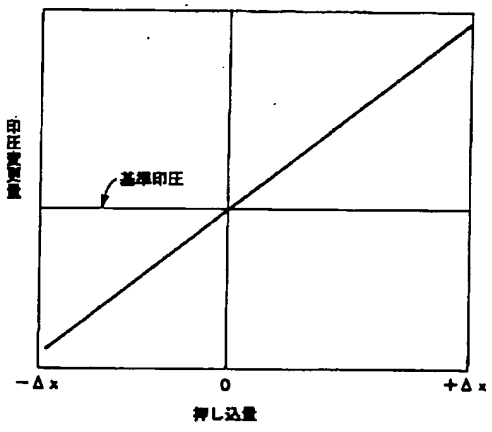


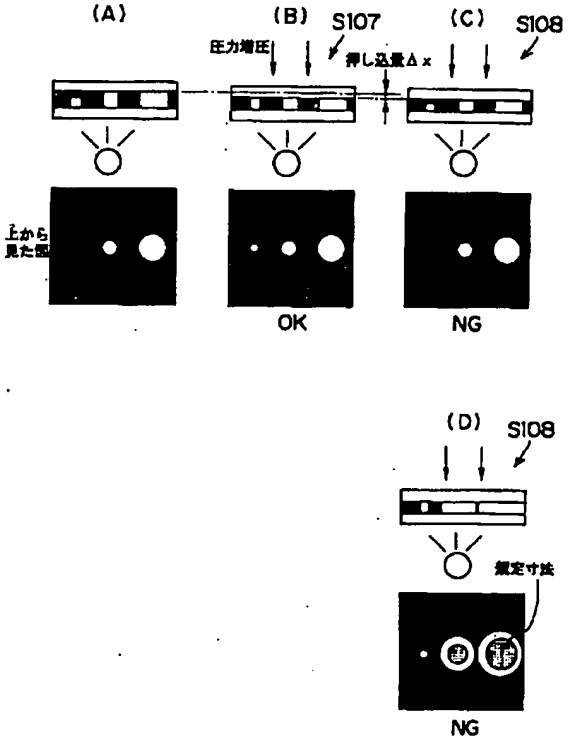
【図４】



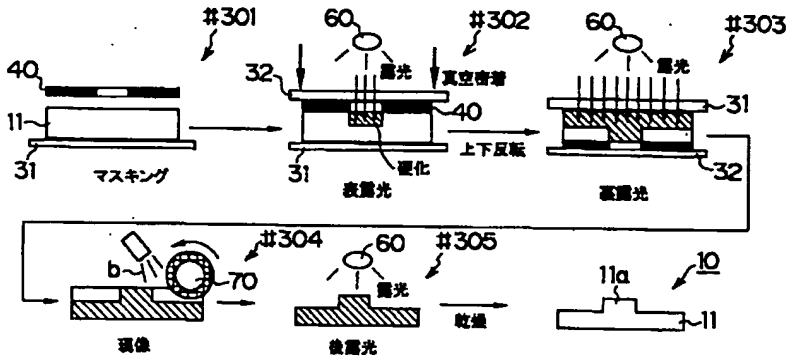
【図５】

【図６】

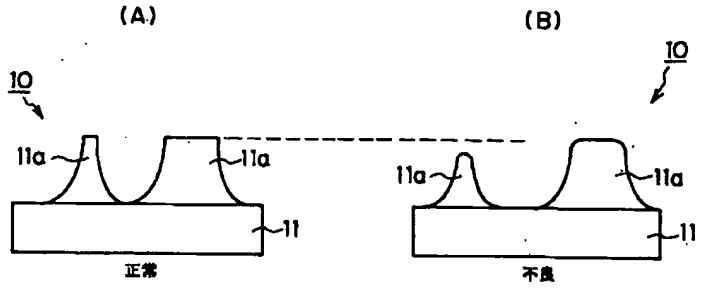




【図７】



【図８】



TRANSLATION

(19) Patent Office of Japan (JP)

(12) Gazette of Unexamined Patent Applications (A)

(11) Unexamined Patent Application Publication [Kokai] No.: P2002-137558A

(43) Disclosure Date: May 14, 2002

(51) Int. Cl.[7]	Identification Symbol	FI		Subject Code (reference)
B41N 1/12		B41N 1/12		2G051
B41C 1/00		B41C 1/00		2H084
G01N 21/95		G01N 21/95	Z	2H114
G06T 1/00	300	G06T 1/00	300	5B057

Request for Examination: not yet requested

Number of Claims: 8 OL (Total of 8 pages)

(21) Patent Application [Tokugan] No.: P2000-337130

(22) Filing Date: November 6, 2000

(71) Applicant: 000002897
Dai Nippon Printing Co., Ltd.
1-1-1 Ichigaya-kagacho, Shinjuku-ku, Tokyo

(72) Inventor: Tetsuya HATSUDA
Dai Nippon Printing Co., Ltd.
1-1-1 Ichigaya-kagacho, Shinjuku-ku, Tokyo

(74) Agent: 100092576
Hisao KAMATA, a registered patent attorney

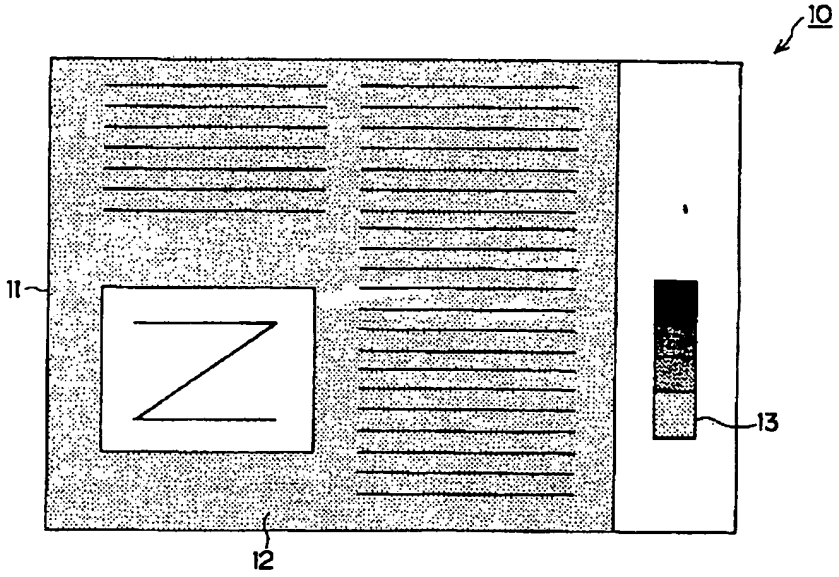
F-terms (Ref.): 2G051 AA90 AB02 AC15 CA04 CB02 EB01
2H084 AA30 AA40 AE07 BB04 CC01
2H114 AA01 BA01 EA01 EA02 GA01
5B057 AA20 BA02 BA19 DA03 DA20 DC03 DC04

(54) Title of the Invention: PRINTING PLATE AND METHOD OF USE THEREOF, PRINTING PLATE QUALITY INSPECTION APPARATUS, AND PRINTING PLATE QUALITY INSPECTION PROCESS

(57) Summary

Object: To enable the quality of a printing plate to be easily inspected without lowering productivity and to enable the printing conditions to be easily determined when a change in printing conditions is required.

Solution: [A printing plate] comprises a printing area 12 that has raised printing features to which ink adheres and which print; and a quality verifying area 13 that has raised quality verifying features which are formed at the same time as the raised printing features in the printing area 12 and that verifies the quality of the raised printing features in the printing area 12 by the quality of the raised quality verifying features.



SPECIFICATION

Claims

(1) A printing plate comprising:
a printing area that has raised printing features to which ink adheres and which print; and
a quality verifying area that has raised quality verifying features which are formed at the same time as the raised printing features in the printing area and that verifies the quality of the raised printing features in the printing area by the quality of the raised quality verifying features.

(2) The printing plate of claim 1, which plate is characterized in that the raised quality verifying features are arranged as a halftone dot pattern.

(3) The printing plate of claim 1 or 2, wherein the raised quality verifying features have a top surface area that is varied in a stepwise manner.

(4) A method for using the printing plate of any one of claims 1 to 3, the method being characterized by dripping an opaque liquid onto the quality verifying area, then sandwiching the printing plate between two flat, light-transmitting members, adjusting the two light-transmitting members to a predetermined interval therebetween, irradiating light thereon from above or below, and carrying out quality verification based on how much of the irradiated light passes therethrough.

(5) A printing plate quality inspection apparatus for inspecting the quality of the printing plate of any one of claims 1 to 3, the apparatus being characterized by having:
two light-transmitting members which are light-transmitting and sandwich therebetween the printing plate on the quality verifying area of which has been dripped an opaque liquid;
a member interval adjusting means for adjusting the light-transmitting members to a predetermined interval;
a light irradiating means for irradiating light, from above or below, onto the printing plate sandwiched between the light-transmitting members adjusted by the member interval adjusting means; and
a quality judging means which judges quality based on how much of the light irradiated by the light irradiating means passes through the printing plate.

(6) The printing plate quality inspection apparatus of claim 5 which is characterized in that, when the quality judging means yields a judgment of "NG," the member interval adjusting means changes the interval between the light-transmitting members until a judgment of "OK" is obtained, and corrected conditions for printing are determined from the changed interval.

(7) A printing plate quality inspection process comprising:
a member interval adjusting step which adjusts to a predetermined interval two light-transmitting members that sandwich therebetween a printing plate having a quality verifying area on which an opaque liquid has been dripped;
a light irradiating step which irradiates light, from above or below, onto the printing plate sandwiched between the light-transmitting members disposed at a predetermined interval in the member interval adjusting step; and

a quality judging step which judges quality based on how much of the light irradiated by the light irradiating means passes through the printing plate.

(8) The printing plate quality inspection process of claim 7 which is characterized by comprising also a corrected condition output step in which, when the judging step yields a judgment of "NG," the interval between the light-transmitting members is changed until a judgment of "OK" is obtained, and corrected conditions for printing are determined from the changed interval.

Detailed Description of the Invention

[0001]

Field of Industrial Use

The present invention relates to printing plates which are highly suitable for use in printing, and particularly flexography, as well as a method of using such printing plates, a printing plate quality inspection apparatus, and a printing plate quality inspection process.

[0002]

Prior Art

FIG. 7 is a diagram showing a method of making relief plates used in flexography. A relief plate 10 for use in flexography is fabricated as follows. The platemaking process involves placing a masking film 40 over a plate material 11 lying on a glass sheet 31 (masking step #301), then placing another glass sheet 32 on the masking film 40 and evacuating the space between glass sheets 31 and 32 so as to cause the masking film 40 to stick to the plate material 11. The assembly is then exposed using a UV lamp 60 (surface exposure step #302), after which it is turned over and the back side is exposed (back exposure step #303). Resin in the unexposed areas is subsequently removed with a rotating brush 70 while applying a liquid developer b (development step #304), after which exposure is carried out again (post-exposure step #305). The extent to which raised features 11a on a relief plate 10 fabricated in this way have cleanly defined top* shapes determines whether an impression can be attractively printed (FIG. 8A). Achieving such a shape requires the proper control of all platemaking conditions, including the sensitivity characteristics of the plate material 11, the exposure conditions, and the development conditions. In the absence of such control, as shown in FIG. 8B, raised features 11a may lack sharpness at the edges thereof or be undesirable in other respects, which can result in the production of poor product having low raised features 11a. However, because the above conditions vary depending on the length of time the exposure lamp is used and the number of times the developer is used, it is necessary to inspect whether parameters such as the sensitivity of the plate material, the light exposure conditions and the development conditions are appropriate. Such inspection methods include techniques involving the use of an optical microscope, a magnifying glass or an electron microscope, and methods that involve dyeing and visual inspection.

---

* Translator's Note: The Japanese term tōchōbu, meaning apex or summit, is translated throughout as "top." Thus, "top shape" and "top surface area" refer to the shape and surface area of a raised feature at its apex.

[0003]
Problems to be Solved by the Invention

However, in methods for inspecting the shape of the raised features 11a using an optical microscope, a magnifying glass or the like, carrying out an accurate inspection is difficult because the plate material 11 is transparent or semi-transparent. Moreover, methods of inspection carried out with an electron microscope involve cutting out a sample for inspection with the electron microscope and require pretreatment such as vapor deposition, in addition to which the apparatus used is of a substantial size. Hence, routine inspection with an electronic microscopic has been difficult to carry out on platemaking lines. In cases where UV-curable areas are dyed for the sake of visual inspection, such dyeing reduces the cure sensitivity and lengthens the time required for curing treatment, which in turn lowers productivity and increases the required UV irradiation energy.

[0004]

If the thickness and hardness of the plate material varies from lot to lot, this may have an effect on the quality--that is, the top shape of raised features--on the printing plates manufactured. In such cases, the printing pressure will vary during printing and the ink transfer ratio will vary at the time of transfer, giving rise to a variability in the overall printing density. In particular, when a printing pressure is applied to printing plates having a raised shape such as those used in flexography, the uppermost relief features are crushed down, which tends to increase the surface area of contact and in turn engenders substantial variation in the color tone of the impressions. Accordingly, in cases where thickness and hardness of the plate material varies from lot to lot, the color tone of the printed impressions is held to a uniform quality by modifying, for example, the printing conditions, the printing plate conditions, the development conditions and the tone curve, but determining how the conditions are to be modified is no easy task.

[0005]

The objects of the invention are to provide a printing plate which can easily be inspected for quality without lowering productivity, and which readily enables the desired printing conditions to be achieved if the printing conditions must be changed. Further objects of the invention are to provide a method of using such a printing plate, a printing plate quality inspecting apparatus, and a printing plate quality inspection method.

[0006]
Means for Solving the Problems

The present invention provides the solutions indicated below to resolve the above problems. To provide greater clarity, reference symbols for embodiments of the invention are included in the descriptions that follow. The invention according to claim 1 for resolving the above problems is a printing plate comprising a printing area 12 that has raised printing features to which ink adheres and which print; and a quality verifying area 13 that has raised quality verifying features which are formed at the same time as the raised printing features in the printing area 12 and that verifies the quality of raised

printing features in the printing area 12 by the quality of the raised quality verifying features.

[0007]

The invention of claim 2 is the printing plate of claim 1, which plate is characterized in that the raised quality verifying features are arranged in the manner of a halftone dot pattern.

[0008]

The invention of claim 3 is the printing plate of claim 1 or 2, wherein the raised quality verifying features have a top surface area that is varied in a stepwise manner.

[0009]

The invention of claim 4 is a method for using the printing plate of any one of claims 1 to 3, the method being characterized by dripping an opaque liquid onto the quality verifying area 13, then sandwiching the printing plate between two flat, light-transmitting members 21 and 22, adjusting the two light-transmitting members 21 and 22 to a predetermined interval therebetween, irradiating light thereon from above or below, and carrying out quality verification based on how much of the irradiated light passes therethrough.

[0010]

The invention of claim 5 is a printing plate quality inspection apparatus for inspecting the quality of the printing plate of any one of claims 1 to 3, the apparatus being characterized by having two light-transmitting members 21 and 22 which are light-transmitting and sandwich therebetween a printing plate 10 on the quality verifying area 13 of which has been dripped an opaque liquid; a member interval adjusting means 24 for adjusting the light-transmitting members 21 and 22 to a predetermined interval; a light irradiating means 23 for irradiating light, from above or below, onto the printing plate 10 sandwiched between the light-transmitting members 21 and 22 adjusted by the member interval adjusting means 24; and a quality judging means 27 which judges quality based on how much of the light irradiated by the light irradiating means 23 passes through the printing plate 10.

[0011]

The invention of claim 6 is the printing plate quality inspection apparatus of claim 5 which is characterized in that, when the quality judging means 27 yields a judgment of "NG," the member interval adjusting means 24 changes the interval between the light-transmitting members 21 and 22 until a judgment of "OK" is obtained, and corrected conditions for printing are determined from the changed interval.

[0012]

The invention of claim 7 is a printing plate quality inspection process comprising a member interval adjusting step (S102) which adjusts to a predetermined interval two light-transmitting members 21 and 22 that sandwich therebetween a printing plate 10

having a quality verifying area 13 on which an opaque liquid has been dripped; a light irradiating step (S103) which irradiates light, from above or below, onto the printing plate 10 sandwiched between the light-transmitting members 21 and 22 disposed at a predetermined interval in the member interval adjusting step (S102); and a quality judging step (S104) which judges quality based on how much of the light irradiated by the light irradiating means passes through the printing plate (10).

[0013]

The invention of claim 8 is a printing plate quality inspection process which is characterized by comprising also corrected condition output steps (S110) and (S117) in which, when the judging step (S104) yields a judgment of "NG," the interval between the light-transmitting members 21 and 22 is changed until a judgment of "OK" is obtained, and corrected conditions for printing are determined from the changed interval.

[0014]

Mode of Working the Invention

The mode of working the present invention is described more fully below while referring to the attached diagrams.

First Embodiment

FIG. 1 is a plan view showing a first embodiment of the printing plate according to the present invention. Elements having functions like those in the prior art described above have been assigned the same reference symbols. A printing plate 10 has, formed on a plate material 11, a printing area 12 and a quality verifying area 13. This printing plate 10 is a relief plate for use in flexography and the like.

[0015]

The plate material 11 is made of a photosensitive resin. The photosensitive resin cures or becomes insoluble upon exposure to ultraviolet light having a wavelength of about 350 to 400 nm. The unexposed areas, which do not change, are soluble in an aqueous alkali solution or an organic solvent such as an alcohol.

[0016]

The printing area 12 is a portion of the plate material 11 where ink adheres and which carries out printing. Raised printing features are formed on the printing area 12. Ink adheres to the tops of these raised printing features, and printing is thereby carried out.

[0017]

The quality verifying area 13 is a portion of the plate material 11 which carries out quality verification of the printing plate 10. Raised quality verifying features in the form of halftone dot patterns are formed in the quality verifying area 13. The halftone dot surface area ratio varies in a stepwise manner. These raised quality verifying features are formed at the same time as the raised printing features in the printing area 12. Hence, the quality of the raised quality verifying features is identical with the quality of the raised

printing features in the printing area 12, and so the quality of the raised printing features in the printing area 12 can be verified from the quality of the raised quality verifying features. The quality of the raised quality verifying features is verified by checking the light transmittance when, as subsequently described, an opaque liquid (e.g., a dye solution or India ink) is dripped onto the quality verifying area 13 and [the printing plate] is then sandwiched between transparent sheets 21 and 22. This quality is the basis on which the quality of the raised printing features in the printing area 12 is verified as described above.

[0018]

FIG. 2 shows a first embodiment of the printing plate quality inspecting apparatus according to the present invention. The printing plate quality verifying apparatus 20 has transparent sheets 21 and 22, a light source 23, a pressing mechanism 24, a pressing mechanism controller 25, a camera 26, and a decision processor 27.

[0019]

Transparent sheet 21 is a plate-like body on which the printing plate 10 fabricated in the preceding step is placed. The transparent sheet 21 must be capable of transmitting light. For example, a sheet of clear, colorless glass may be suitably used. The transparent sheet 22 is a plate-like body which is placed on top of the printing plate 10 and, together with transparent sheet 21, sandwiches therebetween the printing plate 10. Transparent sheet 22, like transparent sheet 21, also must be capable of transmitting light, and is preferably similar to transparent sheet 21.

[0020]

The light source 23 illuminates the printing plate 10. In the present embodiment, the light source 23 illuminates the printing plate 10 from below transparent sheet 21. The pressing mechanism 24 is a mechanism which applies pressure to the transparent sheet 22, causing it to move vertically. The pressing mechanism controller 25 receives pressing command signals from a decision processor 27 and controls the pressing mechanism 24. The camera 26, which takes an image of the state of the light that has passed through the printing plate 10 sandwiched between transparent sheets 21 and 22, is freely movable in the front-to-back and left-to-right directions, as indicated by the arrows. In the present embodiment, the camera 26 images, from above the transparent sheet 22, the state of light that has passed through the printing plate 10. When the camera 26 images the state of light that has passed through the printing plate 10, the resulting image signals are sent to the decision processor 27.

[0021]

The decision processor 27 receives picture signals from the camera 26 and decides whether the size of the halftone dot pattern based on the transmitted light agrees with the required dimensions. If the size of the halftone dot pattern agrees with the required dimensions, this means that the state of development by the printing plate 10 is good (OK). When the decision processor 27 decides that the size of the halftone dot pattern is not within the required dimensions, this means the state of development by the printing

plate 10 is not good (NG). In the latter case, a procedure is carried out for changing the printing conditions. That is, the decision processor 27 sends pressing command signals to the pressing mechanism controller 25, thereby changing the pressure applied by the pressing mechanism 24 to the transparent sheet 22, and examines the conditions under which the size of the halftone dot pattern will be within the required dimensions.

[0022]

FIG. 3 is a flow chart showing the operation of the printing plate quality inspecting apparatus, FIG. 4 is a diagram illustrating the method of inspection by the printing plate quality inspecting apparatus, FIG. 5 is a diagram showing the method used by the printing plate quality inspecting apparatus to output printing pressure correcting values, and FIG. 6 is a depression versus printing pressure graph for the printing plate quality inspecting apparatus. An opaque liquid is dripped onto the printing plate 10 (step (abbreviated hereinafter as "S") 101; FIG. 4A) so as to fill it, following which the transparent sheet 22 is set thereon and pressure is applied with the pressing mechanism 24 (S102; FIG. 4B). When the distance to the printing plate 10 has reached the required dimension, the printing plate 10 is irradiated by the light source 23, and halftone dot patterns due to the transmitted light are imaged by the camera 25 (S103). The decision processor 27 then decides whether all the halftone dot patterns can be verified (S104; FIGS. 4C-4E).

[0023]

If all the halftone dot patterns cannot be verified, that is, in cases where only some of the halftone dot patterns can be verified (FIG. 4D) or cases where all the halftone dot patterns cannot be verified (FIG. 4E), a decision can be made that the tops of the raised features in the printing plate 10 are lower than the required dimension and that the opaque liquid comes between the printing plate 10 and the transparent sheet 22. Such an outcome is probably attributable to problems with the printing plate quality (e.g., cases where development is poor owing to a decline in the exposure sensitivity of the plate material making up the printing plate or to inappropriate development processing, and cases where the plate is too thin), resulting in raised features of inadequate height.

[0024]

If all the halftone dot patterns cannot be verified (FIG. 5A), the pressing mechanism 24 increases the pressing force on the transparent sheet 22 so as to push down (depress)* the transparent sheet 22 (S105), and the halftone dot pattern of light transmitted by the transparent sheet 22 is imaged by the camera 25 (S106). Until all the halftone dot patterns are within the required dimensions (S107), pressure continues to be applied within a range that does not exceed the depression upper limit (S108).

[0025]

When all the halftone dot patterns are within the required dimensions (S107; FIG. 5B), the amount of change in the printing pressure with respect to the standard printing

* TN: The Japanese terms oshikomi and oshikomi-ryō, literally meaning "to push in" and "amount pushed in", are rendered below as "to depress" and "depression."

pressure is determined from the depression versus printing pressure graph (FIG. 6), and is output as a printing pressure correcting value (S110). In addition, more specific details of changes in the printing conditions, such as the gap between the printing plate and the impression cylinder and a change in the cushion tape used on the printing material, may be output. On the other hand, in the case of a halftone dot pattern which cannot be verified even with depression to the depression upper limit (S108) (see FIG. 5C) or in cases where the tips of the raised features crush down, increasing the contact surface area and creating a halftone dot pattern which exceeds the required dimensions (FIG. 5D), because these situations cannot be addressed by changing the pressing conditions during printing, a "no good" (NG) signal is output (S109) and processing is stopped (S119). In this case, the printing plate and development conditions are reexamined, and solutions such as changing the plate material are separately investigated.

[0026]

When a halftone dot pattern can be verified (S104; FIG. 4C), the printing plate quality verification apparatus decides whether that halftone dot pattern is within the required dimensions (S111). If it is not within the required dimensions (FIG. 5D), the reason is probably that the tips of the raised features have been crushed down, increasing the contact surface area so that the halftone dot pattern exceeds the required dimensions. In such a case, the pressure applied to the transparent sheet 22 by the pressing mechanism 24 is reduced (S112), the halftone dot pattern of light passing through the transparent sheet 22 is imaged with the camera 25 (S113), and the pressure continues to be reduced until all the halftone dot patterns are within the required dimensions (S114), so long as the depression lower limit is not exceeded (S115).

[0027]

If the halftone dot pattern is within the required dimensions (S114), the amount of change in the printing pressure with respect to the standard printing pressure is determined from the depression versus printing pressure graph (FIG. 6) and output as a printing pressure correcting value (S117). In addition, more specific details of changes in the printing conditions, such as the gap between the printing plate and the impression cylinder, and a change in the cushion tape used on the plate material, may be output. On the other hand, if there are halftone dot patterns which exceed the required dimensions even when the depression lower limit has been reached (S115), such a situation cannot be addressed by changing the pressing conditions during printing, and so a NG signal is output (S119) and processing is stopped (S119).

[0028]

If all the halftone dot patterns can be verified (S104) and those halftone dot patterns are within the required dimensions (S111; FIG. 4C), the quality of the printing plate 10 is good and the printing plate quality inspecting apparatus can decide that there is no room for the opaque liquid to enter between the printing plate 10 and the transparent sheet 22. An OK signal is therefore output (S118) and processing is stopped (S119).

[0029]

The present embodiment can easily verify the quality of a printing plate merely be filling a quality verifying area 13 on the printing plate with an opaque liquid and checking the light transmittance when the printing plate is sandwiched between two transparent sheets 21 and 22. Moreover, when the quality is poor, the printing correcting conditions can be promptly indicated. Hence, a deterioration in the printing plate quality arising from changes in the sensitivity of the plate material or the characteristics of the developer can be quickly caught, enabling a stable printing plate quality to be achieved. Moreover, even in cases where the color tone of impressions changed due to differences between lots of the plate material and the conditions were reconsidered in the printing shop, obtaining the printing condition correcting values beforehand made it possible to increase the efficiency with which the conditions can be changed, which in turn enabled the production efficiency to be enhanced.

[0030]

Modified Embodiments

Various modifications and changes are possible without limitation to the above-described embodiments while remaining within the scope of equivalence for the present invention. For example, the transparent sheets are not limited to glass sheets, and may be sheets of transparent plastic, for example, so long as they have a high light transmittance. Moreover, in the present embodiments of the invention, the quality verifying area is formed of a halftone dot pattern, although a similar effect can be achieved with, for example, a checkerboard pattern.

[0031]

Advantages of the Invention

As described in detail above, according to the invention of claim 1, by having a printing area that has raised printing features to which ink adheres and which print and by having also a quality verifying area that has raised quality verifying features which are formed at the same time as the raised printing features in the printing area, the quality of the raised printing features can be easily verified by verifying the quality of the raised quality verifying features.

[0032]

According to the invention of claim 2, the raised quality verifying features are arranged as a halftone dot pattern, thus facilitating quality verification.

[0033]

According to the invention of claim 3, the raised quality verifying features have a top surface area that is varied in a stepwise manner, thus enabling more accurate quality verification.

[0034]

According to the invention of claim 4, quality can easily be verified because, after an opaque liquid is dripped onto the quality verifying area, the printing plate is

sandwiched between two flat, light-transmitting members, the two light-transmitting members are adjusted to a predetermined interval therebetween, light is irradiated thereon from above or below, and quality verification is carried out based on how much of the irradiated light passes therethrough.

[0035]

According to the invention of claim 5, quality can easily be verified because there are provided two light-transmitting members which are light-transmitting and sandwich therebetween a printing plate on a quality verifying area of which has been dripped an opaque liquid; a member interval adjusting means for adjusting the light-transmitting members to a predetermined interval; a light irradiating means for irradiating light, from above or below, onto the printing plate sandwiched between the light-transmitting members adjusted by the member interval adjusting means; and a quality judging means which judges quality based on how much of the light irradiated by the light irradiating means passes through the printing plate.

[0036]

According to the invention of claim 6, corrected conditions for printing can easily be determined because, when the quality judging means yields a judgment of "NG," the member interval adjusting means changes the interval between the light-transmitting members until a judgment of "OK" is obtained, and corrected conditions for printing are determined from the changed interval.

[0037]

According to the invention of claim 7, simple quality judgment is possible because two light-transmitting members that sandwich therebetween a printing plate having a quality verifying area on which an opaque liquid has been dripped are adjusted to a predetermined interval, light is irradiated from above or below onto the printing plate, and quality is judged based on how much of the light irradiated by the light irradiating means passes through the printing plate.

[0038]

According to the invention of claim 8, corrected conditions for printing can easily be determined because, when the judging step yields a judgment of "NG," the interval between the light-transmitting members is changed until a judgment of "OK" is obtained, and corrected conditions for printing are determined from the changed interval.

Brief Description of the Diagrams

FIG. 1 is a plan view showing a first embodiment of the printing plate according to the present invention.

FIG. 2 shows a first embodiment of the printing plate quality inspecting apparatus according to the present invention.

FIG. 3 is a flow chart depicting the operation of the printing plate quality inspecting apparatus.

FIG. 4 is a diagram illustrating a method of inspection by the printing plate quality inspecting apparatus.

FIG. 5 is a diagram showing the method used by the printing plate quality inspecting apparatus to output printing pressure correcting values.

FIG. 6 is a depression versus printing pressure graph for the printing plate quality inspecting apparatus.

FIG. 7 is a diagram showing a method of making relief plates used in flexography.

FIG. 8 is a diagram showing normal (OK) and defective (NG) states on a manufactured relief plate.

Explanation of the Reference Symbols

10: Printing plate
11: Plate material
12: Printing area
13: Quality verifying area
20: Printing plate quality inspecting apparatus
21, 22: Transparent sheets
23: Light source
24: Pressing mechanism
25: Pressing mechanism controller
26: Camera
27: Decision processor

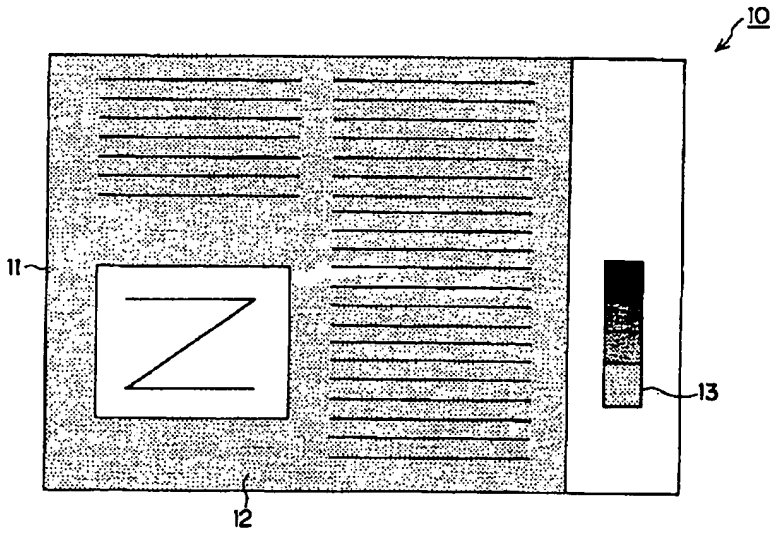


FIG. 1

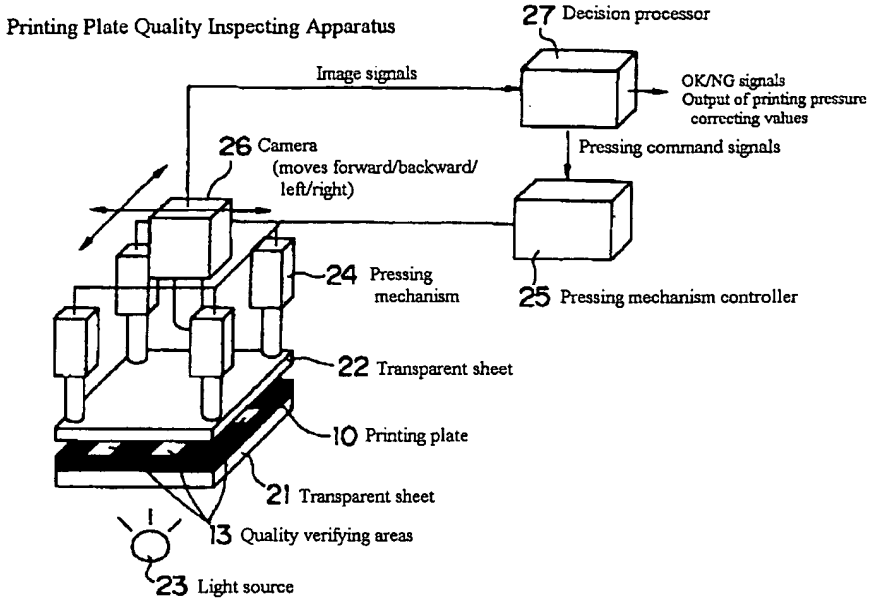
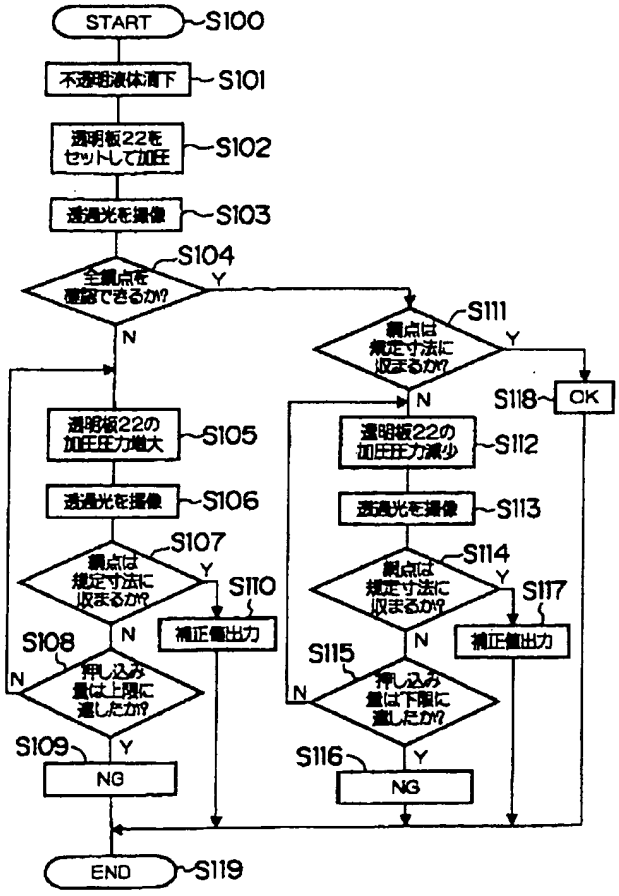


FIG. 2



S101: Drip opaque liquid
S102: Set transparent sheet 22 and apply pressure
S103: Image transmitted light
S104: Can all halftone dot patterns be verified?
S105: Increase pressure applied to transparent sheet 22
S106: Image transmitted light
S107: Are halftone dot patterns within required dimensions?
S108: Has depression upper limit been reached?
S110: Output correcting value
S111: Are halftone dot patterns within required dimensions?
S112: Reduce pressure applied to transparent sheet 22
S113: Image transmitted light
S114: Are halftone dot patterns within required dimensions?
S115: Has depression lower limit been reached?
S117: Output correcting value

FIG. 3

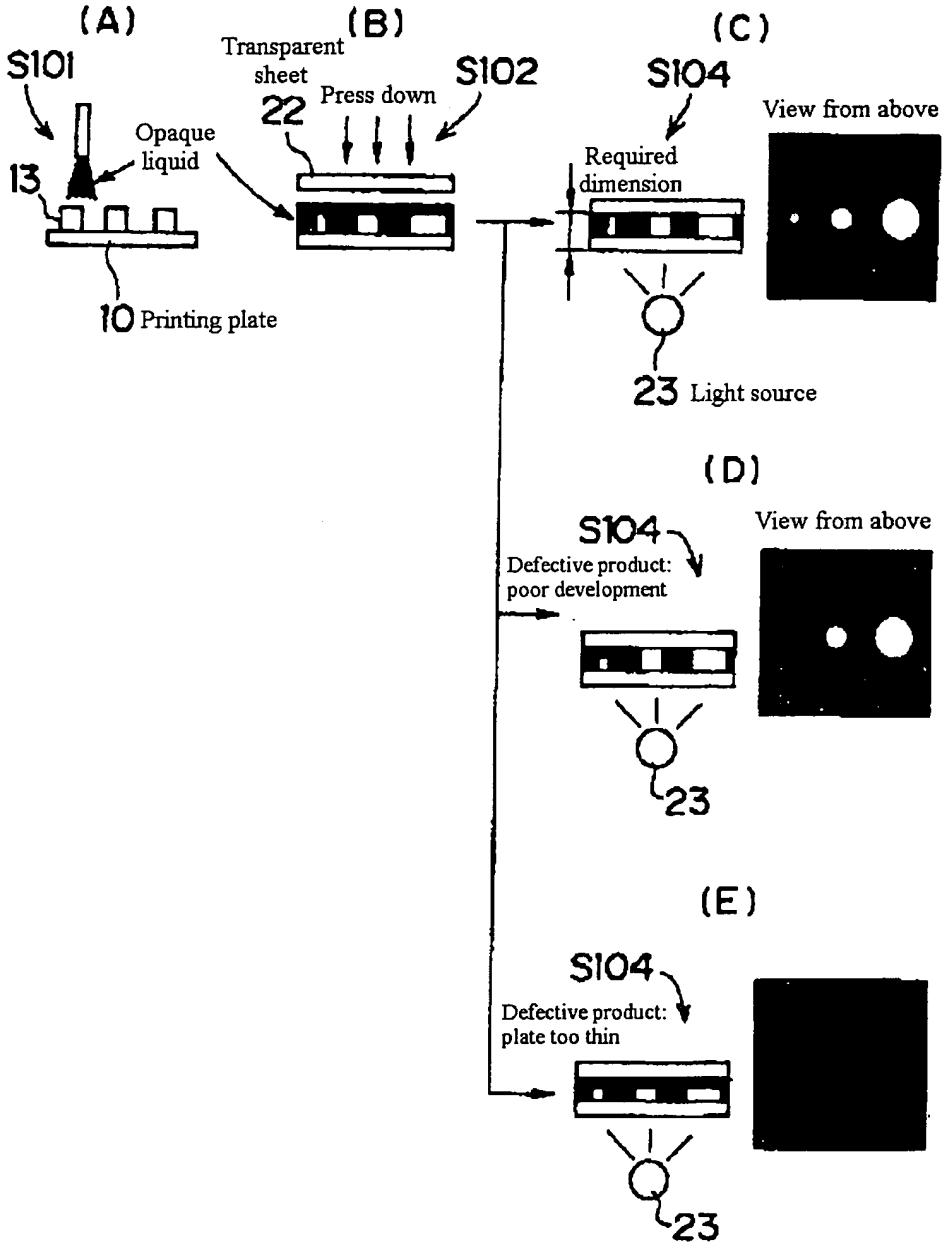

(A)
S101
Opaque liquid
13
10 Printing plate
(B)
Transparent sheet
22
Press down
S102
(C)
S104
Required dimension
View from above
23 Light source
(D)
S104
Defective product: poor development
View from above
23
(E)
S104
Defective product: plate too thin
23

FIG. 4

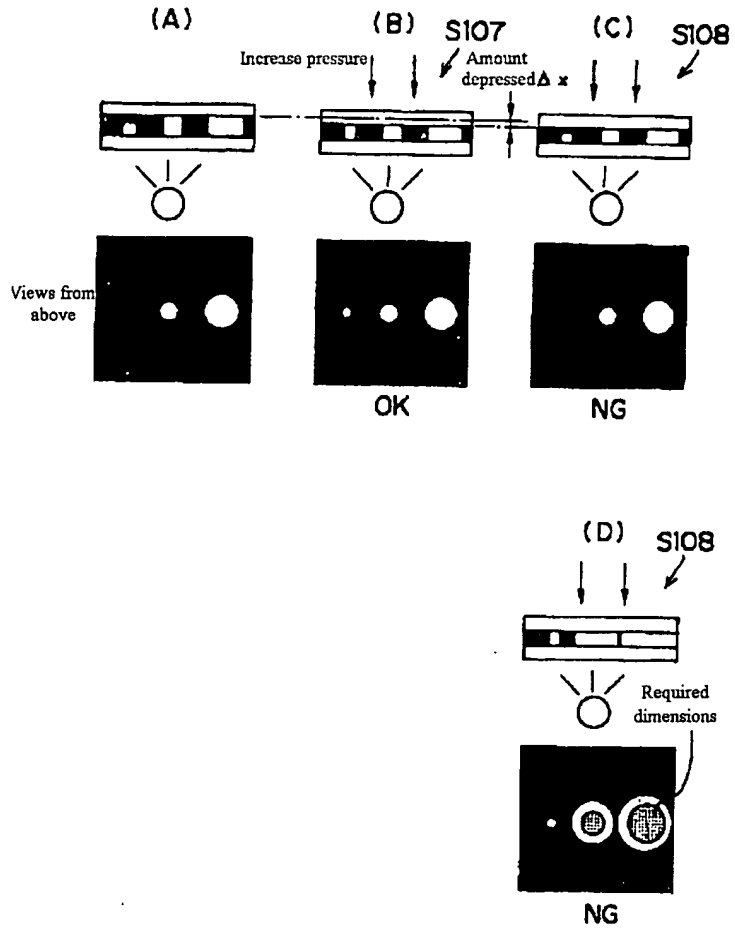

(A)
(B)
S107
(C)
S108
Increase pressure
Amount depressed Δ x
Views from above
OK
NG
(D)
S108
Required dimensions
NG

FIG. 5

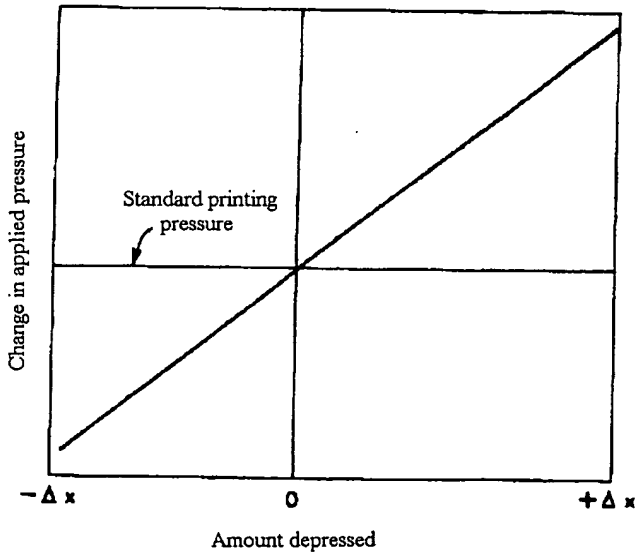

Change in applied pressure
Standard printing pressure
−Δ x
0
+Δ x
Amount depressed

FIG. 6

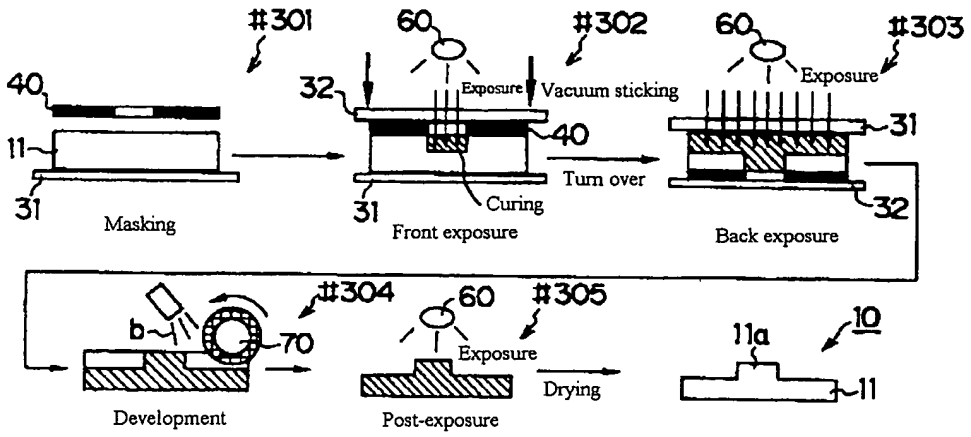


FIG. 7

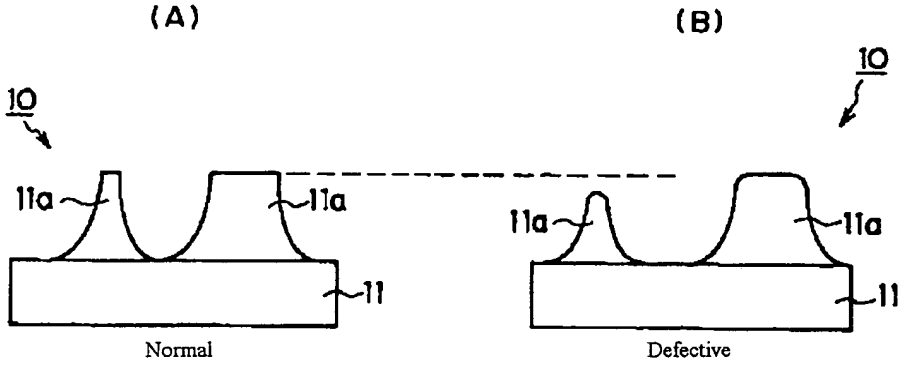


FIG. 8

Translation: Language Services
F. Metreaud
November 30, 2004